NASA LAUNCH EQUIPMENT TEST FACILITY (LETF) OPERATIONS AND MANAGEMENT PLAN

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ENGINEERING DIRECTORATE

March 6, 2019

National Aeronautics and
Space Administration

John F. Kennedy Space Center

KSC FORM 16-12 (REV. 6/95) PREVIOUS EDITIONS ARE OBSOLETE (CG 11/95)

NASA LAUNCH EQUIPMENT TEST FACILITY (LETF) OPERATIONS AND MANAGEMENT PLAN

Prepared By:

_____
Kevin M. Jumper, NE-L1
LETF Lab Manager

Approved By:

_____
Jeff Crisafulli, NE-L1
Chief, Test and Design Branch

_____
Roger Hanak, TOSC-5350
LETF Group Manager
Test and Operations Support Contract

_____
Dionne B. Jackson, NE-L3
Chair, Safety & Health Review Board

March 6, 2019

JOHN F. KENNEDY SPACE CENTER, NASA

RECORD OF REVISIONS/CHANGES

REV LTR	CHG NO.	DESCRIPTION	DATE
Basic		Initial release	October 20, 2010
A		Performed revision to align with KSC-PLN-2322	June 11, 2012
B		Performed revision to reflect contract change from the Engineering Services Contract (ESC) to Test and Operations Support Contract (TOSC). Updated format to follow parent document KSC-PLN-2322. Updated document to reflect TOSC processes, procedures and role at the LETF.	March 6, 2019

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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

Units of measure and some terms commonly understood within the subject disciplines have been abbreviated in the body of this document without callout but are included among the following:

ASC	Authorized Shop Capability
AVO	Avoid Verbal Order
COTR	Contracting Officer's Technical Representative
COTS	commercial off the shelf
DAS	Data Acquisition System
DDT&E	Design, Development, Test and Evaluation
DoD	Department of Defense
(I)ERB	(Integrated) Engineering Review Board
GORA	Ground Operations Risk Assessment
GRRP	Ground Risk Review Panel
GSE	Ground Support Equipment
HARA	Hazard Analysis and Risk Assessment
HSO	NASA and Contractor Hygiene and Safety Officer
ISC	Institutional Services Contract
ISS	International Space Station
KDDMS	Kennedy Design Data Management System
KSC	Kennedy Space Center
LETF	Launch Equipment Test Facility
LM	Laboratory Manager
LSP	Launch Services Program
NASA	National Aeronautics and Space Administration
NCI	NASA Critical Infrastructure
NE	KSC NASA Engineering Directorate
NESC	NASA Engineering and Safety Center
NTM	NASA Test Manager
ODC	Other Direct Cost
OJT	On the Job Training
OM	Operating Manual
O&M	Operations and Maintenance
OMCR	Operations Maintenance Control Requirement
OP	Operating Procedure
OTP	Operations and Test Panel
PAWS	Paging and Area Warning System
PMI	Preventive Maintenance Instruction
POC	Point of Contact
PPE	Personal Protective Equipment
R&D	Research and Development
RAM	Requirement Allocation Matrix
RCM	Reliability Centered Maintenance
RFP	Request For Proposal
SA	KSC NASA Safety Directorate

SHRB	Safety and Health Review Board
SLS	Space Launch System
SMA	Safety & Mission Assurance
TCR	TOSC Change Request
TME	Test and Measuring Equipment
TOSC	Test and Operations Support Contract
TRR	Test Readiness Review
VMS	Vehicle Motion Simulator
WAD	Work Authorization Document
WYE	Work Year Equivalent

1.0 Introduction

1.1 Scope

This plan will outline the KSC NASA Engineering Directorate's roles and responsibilities in the management and operations of the KSC Launch Equipment Test Facility (LETF). Specifically it will outline the NASA management strategy and Contractor roles and responsibilities for all functions or activities in regards to the LETF operations, operations and maintenances processes, fabrication testing, and safety management for the LETF. This plan supplements KSC-PLN-2322 and the intent is for both plans to be used concurrently.

1.2 Purpose

The purpose of this plan is to put in place the processes and procedures needed to allow the NASA Engineering Directorate to manage and oversee the LETF in support of NASA Programs that utilize the LETF capabilities. The LETF is expected to execute activities that include:

- Test and analysis in support of flight/ground hardware/software processing
- Ground systems Design, Development, Test and Evaluation (DDT&E)
- Research and technology development
- Operations & Maintenance (O&M) of labs and shops located in the LETF
- O&M of Test infrastructure, fixtures and systems
- Fabrication and system integration activities

- As such, it is imperative NASA put in place the technical and managerial oversight in partnership with the Contractor that will assure test infrastructure and engineering capabilities are operated and maintained in the most efficient and cost effective manner possible while ensuring personnel safety and protecting flight, Ground Support Equipment (GSE), facility and test infrastructure. Refer to Appendix B for an outline of the required Contractor planning required to meet this plan.

2.0 Documents

2.1 Applicable Documents

The following documents form a part of this document to the extent specified herein.

29CFR 1910.103	Hydrogen
B-0021	Safety and Health Review Board Charter
NASA Form 1707	Special Approvals and Affirmations of Requisitions
KDP-KSC-P-1473	KSC Mishap Reporting and Investigating
KDP-KSC-P-3621	Ground-Based Pressure Vessels and Pressurized Systems (PVS) Certification
KDP-KSC-P-5458	Capabilities Determination Process
KDP-KSC-P-5459	Safety and Health Review Board (SHRB) Process
KDP-KSC-P-9090	Task Order Request (TOR) and Task Plan Process
KNPD 8500.1	KSC Environmental Management
KNPR 1840.19	KSC Industrial Hygiene Programs
KNPR 8700.2	KSC System Safety and Reliability Analysis Procedural Requirements
KNPR 8715.3-1	KSC Safety Procedural Requirements, Volume 1, Safety Procedural Requirements for Civil Servants/NASA Contractors
KNPR 8715.3-3	KSC Safety Procedural Requirements, Volume 3, Safety Procedural Requirements for Partner Organizations Operating in Exclusive-Use Facilities
KNPR 8730.1	KSC Metrology and Calibration Procedural Requirements
KSC-NE-13219	NASA KSC NE Laboratory (LAB) Pressure Vessel and Pressurized Systems (PVS) Policy
KSC-PLN-1800	Laboratory, Shop and Test Facility Safety and Chemical Hygiene Plan
KSC-PLN-2322	Laboratory, Shop, and Test Facility Management Plan
KSC-UG-2804	Reporting Hazards and Safety Concerns
NASA-STD-8719.9	NASA Standard for Lifting Devices and Equipment
NASA-STD-8719.17	NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems (PVS)
NASA-STD-8739.8	NASA Software Assurance Standard
NPR 1800.1	NASA Occupational Health Program Procedure
QU-0005-NASA	NASA LETF Test Manager Qualification Criteria Sheet

OJT-0005-NASA	NASA LETF Test Manager OJT
JT000014-Vol-I	TOSC Safety Operating Plan Volume I
JT000014-Vol-II	TOSC Safety Operating Plan Volume II

2.2 Reference Documents

The following documents are not cited herein, but are listed for informational purposes.

29 CFR 1910.1200	Occupational Safety and Health Standards, Toxic and Hazardous Substances, Hazard communication
29 CFR 1910.132-138	Occupational Safety and Health Standards, Personal Protective Equipment
29 CFR 1910.1450	Occupational Safety and Health Standards, Toxic and Hazardous Substances, Occupational exposure to hazardous chemicals in laboratories
ASTM F2412	Standard Test Methods for Foot Protection
CGA G-5	Hydrogen
CGA P-1	Standard for Safe Handling of Compressed Gases in Containers
CGA P-12	Safe Handling of Cryogenic Liquids
ISBN: 978-0-309-13864-2	National Research Council, Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, National Academy Press, Washington, D.C., 1995
KDP-KSC-P-3001	Warning, Alerting, and Evacuation
KDP-KSC-P-3008	Hazardous Materials Emergency Response
KNPD 1860.1	KSC Ionizing Radiation Protection Program
KNPR 1440.6	KSC Records Management
KNPR 1820.3	KSC Hearing Loss Prevention Program
KNPR 1820.4	KSC Respiratory Protection Program
KNPR 1840.1	KSC Hazard Communication Program
KNPR 8500.1	KSC Environmental Requirements
KNPR 8715.5	KSC Personal Protective Equipment (PPE)
KSC-PLN-2305	KSC Engineering & Directorate (NE) Qualification Plan and Requirements Document
NASA-STD-8719.11	Safety Standard for Fire Protection
NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals
NFPA 55	Compressed Gases and Cryogenic Fluids Code

NFPA 497	Recommended Practice for the Classification of Flammable Liquids, Gasses or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

3.0 Work Area Operations

3.1 Overall Operations and Safety

The LETF is a unique facility which provides testing, development, fabrication and evaluation services for mechanical components, ground support equipment, instrumentation / electrical components and facilities. The Laboratory Manager (LM) for the LETF is the NASA LETF Manager (NE-L1).

OSHA's Personal Protective Equipment (PPE) standards, 29 CFR 1910.132-138 mandate that PPE is required when other health hazard controls, such as engineering and administrative controls, have been shown to be inadequate in eliminating or controlling the health hazard.

In general, ASTM F2412 compliant hard-toe footwear, hard hats and safety glasses are required for employees who work in the LETF shop and yard areas. Visitors without safety shoes shall limit access in the shop areas to the center isles marked with striped tape. Visitors accessing the LETF yard shall be escorted by LETF personnel to ensure work area clears and/or control areas are understood and adhered to. Visitors shall be given an LETF Visitors Safety Briefing prior to accessing LETF work areas.

Environmental Health has performed assessments of LETF operations and determined that use of respirators is not normally required. For new operations that need to be assessed, the Hygiene & Safety Officer (HSO) will contact Environmental Health, who will evaluate the task and identify the appropriate respirators for use based on the hazards identified. Refer to KSC-PLN-1910 for tasks that may require respirators.

The location of PPE and emergency eye wash are shown in Appendix D. Some PPE is stored in individual work areas.

Fall protection is required when working at heights. Fall protection PPE is inspected semi-annually by TOSC Safety, but shall be inspected prior to each use.

Refer to the Authorized Shop Capability (ASC) for specific PPE requirements for each manufacturing and testing process. Safety glasses shall be worn when performing the manufacturing or testing process or when in the affected area of the potential hazard.

3.1.1 Emergency Procedures

In case of emergency, call 911 (321-867-7911 on a cell phone). Notify the NASA LETF Manager, TOSC LETF Group Manager, HSO and TOSC Shop Supervisor.

3.1.2 Evacuation Procedures

The LETF primary facility locations are M7-0505 and M7-0508. Facility Evacuation plans for these locations are defined in KSC-PLN-EVAC-0061 (M7-0505) and KSC-PLN-EVAC-1201 (M7-0508).

There are fire alarm pull stations located throughout the facility and these should be used in accordance with KDP-KSC-P-3001. In the event of an emergency, personnel should evacuate to the Marshalling Areas identified in the noted evacuation plans and contact their supervisor either in person or by cell phone.

There are fire extinguishers located throughout the facility and they may be used when necessary for evacuation purposes only. Personnel shall not use fire extinguishers to attempt to contain a fire.

3.1.3 Incidents: Close Calls and Mishaps

Any incident occurring at the LETF must be reported to the NASA LETF Manager, TOSC LETF Group Manager and HSO by the personnel involved in the incident. Personnel should follow KDP-KSC-P-1473.

3.1.4 Hazardous Atmospheres

During hazardous operations the potential for Hazardous atmospheres exist in this facility, a Health Hazard Evaluation (HHE) shall be performed in accordance with TOSC HSEP 12.1 to determine the need to conduct further industrial hygiene surveys and monitoring including integrated air sampling, noise dosimetry, and other exposure assessments.

3.1.5 Spills

Spills are handled in accordance with KNPR 8500.1 and KDP-KSC-P-3008, whose relevant content is summarized as follows:

A. Non-emergency Indoor Spill: A non-emergency spill is the release of any chemical or biological material that does not pose an imminent hazard to health or safety or pose an environmental emergency and can be handled by in-house capabilities. Use appropriate PPE and proper disposal methods.

1. Notify the NASA LETF Manager, TOSC LETF Group Manager, TOSC Shop Supervisor and HSO.
2. Promptly clean up the spill using the designated spill kit.

B. Emergency or Outdoor Spill: All other spills are considered emergency spills.

1. Call 911 (321-867-7911 on a cell phone) for assistance. Notify the 911 dispatcher of location of the spill and, if known, the chemical spilled.
2. Notify the NASA LETF Manager, TOSC LETF Group Manager, TOSC Shop Supervisor, HSO and NASA Safety.

LETF personnel should use only the amount of chemicals required for a job. Chemical storage volumes in the LETF should be kept to a minimum. Flammable chemicals are kept in flammable storage lockers. Spill kits are available, contact the TOSC LETF Shop Supervisor for locations. If a spill cannot be contained using the spill kit, employees should vacate the area and call 911 (321-867-7911).

3.1.6 Work Areas

The LETF is divided into various work areas. Refer to Appendix D for additional information.

3.1.7 Food and Drink

No food is allowed in the LETF work areas. The break room located in the Shop Area mezzanine has been designated for food and drinks. Food and drinks are also permissible in the employee offices and cubicles. Absolutely no chemicals shall be used in the break room, conference rooms, or offices/cubicles.

3.1.8 Dress Code

ASTM F2412 compliant hard-toe footwear and safety glasses, long pants (no shorts or skirts) are required for employees who work in the LETF shop and yard areas. Jewelry, scarves, neckties, and loose-fitting clothing that may become entangled in machinery are prohibited around rotating machinery.

3.1.9 Entry Requirements

The LETF has been designated a NASA Critical Infrastructure (NCI) with a Security Level of III per NPR 1620.2 and is a Restricted Area. Entry into the facility is controlled via physical security fences with an access control system / card key and cypher lock entry doors and gates. Access to the facility by personnel not assigned to the LETF shall be coordinated thru the administrative desk in building M7-0508. See Appendix D for additional information.

3.1.10 Eye Washes and Safety Showers

The LETF has eye washes and safety showers. Refer to Appendix D for specific locations.

3.1.11 Securing the LETF and Hardware

Securing of LETF Facility Systems shall be performed via the Emergency Instructions of the Facility System operations procedure. LETF IT Hardware securing shall be performed by IT Security Plan CD-9999-H-KSC-3161 NE Launch Equipment Test Facility, Data Acquisition (LETF-DACS) Security Plan.

3.1.12 LETF Phone Numbers

Important phone lines associated with the LETF are as follows:

- NASA LETF Manager: (321) 867-0476
- TOSC LETF Group Manager: (321) 861-7028
- TOSC LETF Engineering Supervisor: (321) 867-1492
- TOSC LETF Shop Supervisor: (321) 867-2766
- TOSC LETF Instrumentation Supervisor: (321) 867-4707
- TOSC LETF Admin and Conference Room Support: (321) 867-9437
- LETF Control Room (321) 867-3343

3.1.13 Hurricane Preparations

The Contractor is responsible for supporting NASA in preparing the LETF in the event that hurricane related activities are required. Details on securing work areas are covered in KDP-KSC-P-3006.

3.2 Authority to Stop Work

A safety concern can be expressed by anyone and should be expressed directly to the person responsible for executing the action of concern. If an activity poses an immediate risk to safety or health, personnel are expected to use their Stop Work Authority to call a "time out."

After the stop is called, the individual calling the stop work collaborates with the individuals performing the work to determine how the action can be safely resumed. If agreement is not reached or if it is unclear how to safely proceed, the safety or health concern is to be elevated to the NASA LETF Manager or the TOSC Group Manager. The NASA LETF Manager coordinates with Safety and Health and other affected organizations to resolve the disagreement at the lowest management level possible. Anyone can elevate the safety concern to higher levels of management or through safety reporting channels, as needed (see KSC-UG-2804).

The NASA LETF Manager, TOSC Group Manager and applicable leads shall be made aware of all disagreements with the execution of LETF activities, whether internal between LETF personnel or with personnel from other organizations.

3.3 Pressure Vessels and Pressurized Systems

Any new work coming in will be assessed to ensure PVS requirements are met in accordance with NASA-STD-8719.17; KDP-KSC-P-3621; KNPR 8715.3-1 and KSC-NE-13219, as applicable.

3.4 Calibration of Test and Measuring Equipment

Calibration of test and measuring equipment (TME) is performed in accordance with KNPR 8730.1 and KDP-KSC-P-5460.

4.0 Management of LETF Activities

The KSC NASA Engineering Directorate (NE) is responsible for the overall operation of the LETF in partnership with the TOSC. The hierarchy of LETF management starts with the NE Director through the Division Chiefs to the NASA LETF Manager. The NE Division has been tasked to perform the management and oversight of the TOSC contractor in the operation of the LETF and associated systems to ensure safe operation of the LETF. This function is accomplished by the assignment of a NASA LETF Manager. The NASA LETF Manager and the TOSC LETF Group Manager are the primary points of contact for all LETF activities. The day to day operations of the LETF has been assigned to the Contractor (TOSC) per the requirements of NNK13MA14C Statement of Work.

The objectives for the NE management of the LETF are that the following:

- Lines of accountability/authority are understood and clear
- Safe operations of the LETF
- LETF work control and work approval processes are well understood
- Ensure LETF activities are executed in a timely manner
- Standardized rules are adhered for all LETF activities

4.1 Director of Engineering Directorate

The Director of the Engineering Directorate is responsible for the overall safety and management of the LETF and has delegated the accountability for the safe and successful operations of the LETF to the Laboratories, Testing and Development (NE-L) Division Chief, The Director is the ultimate decision maker in cases of dissenting opinions concerning safe operation in the LETF that cannot be resolved at lower levels of management.

4.2 Division Chief

The NE-L Division Chief and NE-L1 Branch Chief are accountable for the safe and efficient operation of the LETF. The NE-L1 Branch Chief appoints the NASA LETF Manager to ensure safe operations. the NE-L1 Branch Chief has Manager.

4.3 NASA LETF Manager

The NASA LETF Manager is accountable for day-to-day operations of the LETF. The NASA LETF Manager and the TOSC LETF Group Manager are the primary points of contact for all activities. The NASA LETF Manager is responsible for the oversight of all test facilities activities conducted by NASA and/or TOSC contractor personnel in the LETF.

The NASA LETF Manager will perform the following duties:

- Act as NASA POC for all O&M activities within the LETF.
- Act as NASA POC for all reoccurring work in regards to testing.
- Act as the POC for all test infrastructures and systems in the LETF. See Appendix B for a list of TOSC assigned systems.
    - Coordinate NASA Engineering support for sustaining engineering.
- Provide guidance and oversight to the contractor on facility use policy and priorities for all LETF activities.
- Act as lead NASA Test Manager for all integrated hazardous test activities in the LETF. This authority can be delegated as required per Section 3.7.
- Act as the Engineering Directorates primary POC for all LETF activities within the Engineering Directorate, other KSC programs/projects, other NASA Centers and outside organizations (corporations and academia) for NASA sponsored activities.

- Accountable for all work functions and operations in the LETF as the NASA Manager of the LETF.
- Responsible for ensuring that the appropriate KSC/NASA organizations review and concur with an operation in the LETF (hazardous or non-hazardous).
- Provide NASA operational oversight in the LETF.
- Provide an advocate within NASA for the system.
- Act as the primary POC for technical issues.
- Approve all modification to the LETF systems.
  - Coordinate NASA engineering design disciplines support of new LETF systems or modification to existing systems required.
- Participate in testing operations from an oversight perspective.

4.4 Hygiene and Safety Officer (HSO)

The HSO is the LETF point of contact for safety policy and issues. The HSO will:

- Ensure that the Contractor generated Chemical Hygiene and/or LETF Safety documentation for the LETF meet the requirements of 29 CFR 1910.1450 and KNPRs 1840.19 and 8715.3-1.
- Participate in the LETF Operations/Test Panel process for LETF activities.
- Ensure personnel have adequate safety and training programs and policy in place to ensure the safe operations in the LETF.
- Review procurements of hazardous chemicals/materials and equipment used in the LETF.

4.5 NASA Facility Manager

The NASA Facility Manager for the LETF shall work with the contractor assigned facility managers per the requirements of the KSC Facility Managers program. Primary duties shall include the NASA oversight and coordination of facility systems O&M. The NASA Facility Manager shall perform other duties as assigned by the NASA LETF Manager. TOSC Facility Management is funded by the TOSC Baseline.

The TOSC shall assign and train per KSC requirement, a facility manager for the locations listed in the table. The LETF consists of the following facilities per the Real Property Management website;

Site	***Contractor Facility Manager***	***NASA Facility Manager***	***Notes***
M7-0505	ISC, T. Baker	UB-C0, B. Pannullo	
M7-0505A	TOSC, J. Starnes	NE-L1, K. Jumper	LETF Shops
M7-0505E	TOSC, J. Starnes	NE-L1, K. Jumper	LETF Storage Building
M7-0507	TOSC, J. Starnes	NE-L1, K. Jumper	LETF Storage Shed
M7-0457	TOSC, J. Starnes	NE-L1, K. Jumper	LETF Storage Building
M7-0508	TOSC, J. Starnes	NE-L1, K. Jumper	LETF Support Building

Site	*Contractor Facility Manager*	*NASA Facility Manager*	*Notes*
M7-0557 (rm. 1145)	TOSC J. Starnes	NE-L2, J. Sass	Building contains LETF Weld Shop

4.6 TOSC LETF Group Manager

The Contractor is responsible for maintaining all systems outlined within this plan in coordination with the NASA LETF Manager. The TOSC LETF Group Manager coordinates and obtains concurrence from the NASA LETF Manager to ensure the fabrication, testing and maintenance objectives are consistent with NASA policies and guidelines.

4.7 NASA Test Manager

This plan calls for a NASA Test Manager to be a part of all major integrated hazardous operations that require a Test Conductor. The NASA Engineering Directorate shall assign qualified personnel to perform this task should NASA Exploration Ground Systems Test Manager personnel be unavailable. Specific roles and responsibilities for the NASA Test Manager (NTM) are as follows:

- Act as final authority for all test activities during the test.
- Coordinate all up and out communication and integration tasks (Fire, Security, NASA Safety Console, Duty Officer, etc.)
- Co-lead all activities, including trouble-shooting, with the TOSC Test Conductor.
    - NTM will have the final go/no go decision with respect to the test article and facility systems safety and integrity.
    - TOSC Test Conductor is responsible for the overall safe execution of testing, operation of the facility, and coordinating test team activities with the concurrence of the NTM.
- Training and certification for this role can be found in QU-0005-NASA (NASA Test Manager LETF Qualification Criteria) and OJT-0005-NASA (NASA Test Manager (LETF) OJT).

Refer to Appendix C for an outline of roles and responsibilities.

4.8 NASA Contracting Officer's Representative (COR)

The role of the NASA Contracting Officer's Representative (COR) is as follows;

- Prepare and develop the TOSC Change Request (TCR) / Avoid Verbal Orders (AVO) for LETF activities.
- Approve the plan.
- Support the development of testing objectives and applicable procedures.

4.9 NASA NE (Integrated) Engineering Review Board

The NASA NE (Integrated) Engineering Review Board (I)ERB provides engineering review and approval involving critical LETF operations, testing, modifications, and designs.

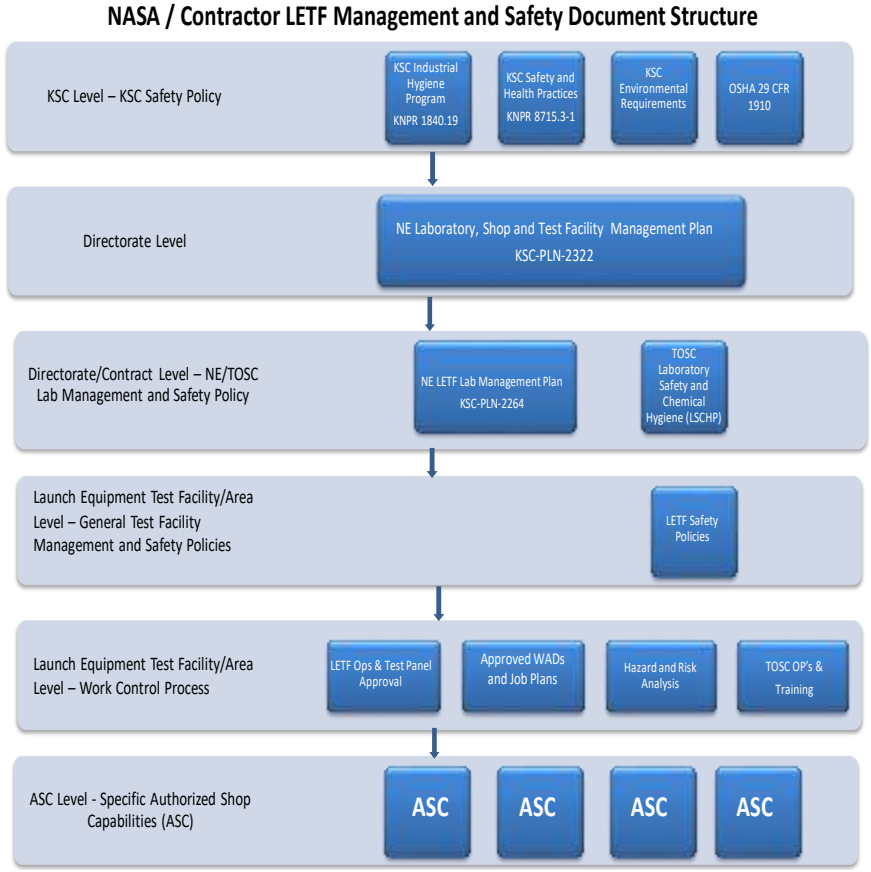
The ERB will:

- Provide a representative to participate in the LETF Operations and Test Panel process for LETF activities when required.
- Have the option to review/approve Level 2 operations/testing that involves the use of critical LETF assets such as the Vehicle Motion Simulator, Cryogenic System, 600 Ton Test Fixture, Vehicle Support Post Test Fixture, Water Flow Test Loop, Instrumentation Trailer, and the Mobile Launcher (ML) Tower Simulators.
- Have the option to participate in LETF Test Readiness Reviews (TRRs) for operations/testing that involves the use of critical LETF assets.
- Review and/or approve baseline requirements for new LETF designs.
- Review and/or approve baseline requirements for modifications to existing systems.
- Review and/or approve major “out of family” anomalies.

5.0 LETF Test and Fabrication Operational Controls

All work in the LETF is compliant with KNPR 8700.2, KNPR 8715.3-1 and is covered by a work control system. The following section outlines the work approval and documentation processes to be utilized in the LETF.

5.1 NASA / Contractor LETF Management & Safety Documentation Structure



5.2 LETF Operations and Test Panel

The LETF has an established Operations and Test Panel (OTP) to review and approve all Level 2 activities in the LETF. The LETF OTP process is defined by TOSC Desk Instruction DI-AM-066, LETF Operations and Test Panel Process. The LETF OTP will meet on an as needed basis to oversee and manage the work scope, safety, and content based on NASA objectives. The panel shall consist of the following members;

- NASA LETF Manager (Co-Chair)
- TOSC LETF Group Manager (Co-Chair)
- TOSC LETF Engineering Supervisor
- TOSC LETF Shop Supervisor
- TOSC S&MA Representative
- NASA S&MA Engineering Representative
- Industrial Hygiene Representative
- TOSC Pressure Vessel System Representative (If required)
- NASA Pressure Vessel System Representative (If required)
- NASA Subject Matter Expert (ERB/Chief Engineer Representative) (If required)
- TOSC Chief Engineer Representative (If required)
- Safety and Health Review Board (SHRB) Representative
- Customer representative for planned operation

The primary purpose of the OTP will be to perform the following functions;

- Verify the activity is classified as Level 2 work; determine if work is covered by an existing documented procedure or Approved Shop Capability (ASC).
- Review the resource requirements, test objectives and coordination with other LETF activities to complete the task and to ensure appropriate support, equipment and resources are called out.
    - LETF test fixtures/shop resources required
    - Required support from non-LETF resources
    - Determine if the requested work is in scope for the LETF capabilities and if resources are available to perform the work within the requested timeframe.
- Review all test procedures and documentation associated with the operations to ensure all TOSC, KSC Specific and NASA guidelines are followed.
- Review and approve the Hazard Analysis and Risk Assessment or Ground Operations Risk Assessment
    - Review the hazard level of the operation and the appropriate risk level as identified per KNPR 8715.3-1 KSC Safety Practices Procedural Requirements.
    - Ensure all hazards and risks have been identified and mitigated, including NASA and Contractor management review and acceptance of risks.
    - Document the risk level within the LETF risk management process as required in this plan.
- Review/approve the schedule for the operation.

- Review the planned work and have it identified on the LETF integrated schedule, including obtaining concurrence from NASA and Contractor LETF management for the planned schedule
- The LETF OTP shall elevate operations or tests for approval by SHRB, GRRP or higher approval authority as required per KNPR 8700.2.

The Contractor shall implement and maintain the LETF OTP process and train the applicable contractor personnel on the process. The Contractor shall publish and maintain per KSC guidelines, minutes that capture the decisions and actions of the LETF OTP.

5.3 Prioritization of Tasks in the LETF

The LETF Management, with concurrence from NASA LETF Manager, shall determine the priority of the work content in the LETF based on NASA's mission.

The LETF has performed prototype development and testing activities in support of EGS, Shuttle, the Launch Service Program, International Space Station, NESC and other institutional programs over the years. This plan establishes a prioritization scheme for activates that utilize LETF resources. Each new activity will be given a priority based on set requirements. It will be the role of the NASA LETF Manager and TOSC LETF Group Manager to determine priorities and how best to resolve any conflicts. If a conflict cannot be resolved, the NASA LETF Manager will be tasked with informing the customer what the implications of the priority are, and how it will impact the requested operation. Standard verbiage shall be developed and included in the risk management section of the project as to what the implications mean. Lower priority projects may have to either be delayed, worked off shift (this would probably increase the costs to the customer) or in some cases, the LETF may have to turn down the project.

The prioritization scheme will have the following guidelines;

If two activities with identical priorities conflict, then the NASA LETF Manager and the TOSC LETF Group Manager will meet to determine the resource allocations. If an agreement cannot be reached, then the issue will be brought to the attention of NASA Engineering senior management for resolution.

Note that this prioritization scheme does not mean that the Contractor cannot schedule the work to meet the Customer's needs or in the most efficient manner possible; the TOSC LETF Group Manager and the NASA LETF Manager have complete discretion to work a priority 5 projects ahead of a priority 1 project based on best utilization of resources. The intent is to give the TOSC LETF Group Manager and the NASA LETF Manager the tools needed to work highest priority work when a conflict arises.

The prioritization scheme will have the following guidelines;

Priority Rank	Title	Examples
1	Support of operational space programs	SLS, ISS, LSP support in regards to support of flight/GSE critical support to meet launch schedules.
2	NASA Development Programs	Support of NASA Development activities
3	Other KSC & Agency organizations	NESC, Institutional Support
4	NASA Research & Development Projects	NASA/KSC R&D Projects or work for other Centers performing R&D.
5	TOSC Work for Others, or low priority work of NASA projects.	Support to Non-NASA customers, such as DoD or Commercial Crew requests.

5.4 Work Instructions and Documentation

5.4.1 Work Control

The Contractor shall maintain a work control system for scheduled and unscheduled maintenance, testing and any other construction, fabrication, and operational activities. Work control is provided through the Maximo and Solumina Work Control Systems. The work control process is defined by TOSC OP-0025, *WAD Authoring Execution,* and the non-conformance process is defined by TOSC OP-0005, *Non-Conformance Process*. Contractor shall maintain a constraint system to identify any open work on LETF systems that could impact either the safety or operational readiness of LETF systems.

5.4.2 Maintenance Operational / Test Procedures

The LETF will have maintenance and operational procedures for LETF systems. These procedures shall undergo a review for applicability to current systems, inclusion of OMCR's (Operation, Maintenance, and Control Requirements) where applicable. In addition, all these procedures will be available electronically.

The Contractor shall develop and maintain a Technical Operating Procedure Preparation guide and a training process to implement. This document shall incorporate all applicable requirements of KNPR 8700.2 , KNPR 8715.3-1 KSC Safety Practices and Procedural Requirements, Chapter 9-Technical Operating Procedures, as well as any applicable Contractor Standard Operating Procedures.

5.4.3 Test Procedures

All operations and tests shall be conducted with an approved Work Authorization Document (WAD) that was developed per TOSC guidelines, and shall meet all NASA Policy and Procedures. Level 2 procedures shall be reviewed and approved by the LETF OTP.

5.5 Operational Testing and Fabrication Activities

5.5.1 Hazardous Operations, Testing and Fabrication

Hazardous tests generally fall into two categories within the LETF, testing that requires integrated control operations and testing that has localized personnel hazards. The following guidelines will apply to all hazardous testing;

- The Contractor shall develop a Hazard Analysis/Risk Assessment (HARA) / Ground Operations Risk Assessment (GORA) for all hazardous operations.
    - The HARA / GORA shall be presented to the LETF OTP for review and approval.
    - The NASA LETF Manager shall review and approve all HARAs/GORAs, hazardous test procedures, maintenance or other operational procedures.
    - NASA Safety Engineering shall review and approve all HARAs/GORAs developed in support of LETF operations.
- The customer that is requesting testing will be given the opportunity to review the test procedures.
- All hazardous operations shall be performed with an approved and documented procedure.
- Hazardous test procedures shall be signed off and distributed to the test team
- The NASA Test Manager shall review and approve all integrated hazardous testing procedures requiring control room operations.
    - NASA Safety will be given the opportunity to be a member of any integrated Test Team that requires a NASA Test Manager.

Integrated hazardous testing (e.g. Level 2 work) shall have a NASA Test Manager in addition to the Contractor Test Conductor. The NASA Engineering Directorate shall assign NASA personnel to perform the role of NASA Test Manager. In addition, a NASA Test Manager may be assigned to a test involving high value or high visibility testing of NASA GSE or flight hardware whether the testing is considered hazardous or non-hazardous. Roles and responsibilities of the test team will be established by the Contractor and concurred with by NASA (refer to Appendix C).

5.5.2 Level 1 Work Classification

Level 1 is defined as all test operations that do not meet the level of hazards documented in KNPR 8700.2. It is at the discretion of the Project Manager and the LETF Engineer assigned to accomplish the task to determine the level of control required with TOSC Safety approval. An example of this type of testing would be the following:

- Fluid valve component testing within design pressures
- Water Flow Loop operations
- Command and Control development activities

5.5.3 Approved Shop Capabilities

Approved Shop Capabilities (ASC) will be developed and maintained by the NASA LETF Manager (ref. KSC-PLN-2322). A list of the current ASCs for the LETF can be found on the LETF Shared Drive LETFEng1 location.

Upon the determination of the NASA LETF Manager or OTP, an (I)ERB and/or SHRB approval may be required for non-ASC operations/testing that involves the use of critical NASA LETF assets such as the Vehicle Motion Simulator, the LETF Cryogenic System, 600 Ton Test Fixture, Vehicle Support Post Test Fixture, Water Flow Test Loop, LETF Instrumentation Trailer, and ML Simulator Towers (refer to sections 3.9 and 4.2 for additional board approvals).

In addition to work classified within an ASC, work and testing within the scope of TOSC OP-0005 or OP-0025, and as required by KNPR 8715.3-1, require implementation using a TOSC work control system, and therefore also require an approved Work Authorization Document. In addition to defining the specific work steps and content, these documents identify the hazards, applications specifications, standards and polices, required PPE and certifications needed for each operation. Certifications for equipment operations are on file per TOSC contract requirements.

5.5.4 Engineering Evaluation Tests/Operations

The Contractor shall develop a process whereby NASA Engineering or its designees will be permitted to perform test/evaluation operations at the LETF on test articles without Contractor Engineering or technician direct support. This type of operation shall be non-hazardous in nature. In addition, this type of operation would not include the use of LETF systems without Contractor personnel operating those systems. Personnel performing these activities must have all applicable training and PPE in regards to work in the LETF. This type of activity will be covered by a generic type Work Order that outlines what work will be performed. The Contractor shall perform an oversight role to ensure the work is performed as documented and in a safe manner. The Contractor shall develop and document a process to cover this type of activity. All work done in this manner will be approved by the LETF OTP.

An example of this type of activity would be as follows;

- Prototype fit up and mates
- Engineering measurements
- Operation on non-hazardous customer supplied equipment to perform engineering evaluation of test articles.

On occasion Space Act Agreements are put in place to create an easy path for outside aerospace providers to utilize our facilities and equipment. Users accountable to follow safety requirements outline in the Task Order Request (TOR) and KNPR 8715.3-1, KSC Safety Procedural Requirements, Volume 3, Safety Procedural Requirements for Partner Organizations Operating in Exclusive-Use Facilities.

5.5.5 NASA Approval/Signature Requirements

NASA signature requirements for TOSC Work Orders are defined in TOSC OP-005, Nonconformance/Problem Reporting and Corrective Action, and TOSC OP-0025, Work Authorization Document (WAD) Authoring/Execution. These documents specify a "Second Set of Eyes" check for accuracy and completeness, approval by associated SMEs, quality and safety approval as applicable, and others, and a final signature(s) by the appropriate NASA personnel. Note: Per these TOSC OPS, the typical last WAD signature is by the "Responsible NASA Operations Engineer"

The NASA LETF Manager is the delegated authority to approve WADs, as the "Responsible NASA Operations Engineer", at the LETF from the System Engineering and Integration Division.

5.5.6 Testing Data Retention Requirements

The Contractor shall develop Operations Procedure (OP) or modify an existing OP for data retention and records keeping regarding LETF activities/testing. The Contractor shall comply with NPD 1440.6 (NASA Records Management), NPR 1441.1 (NASA Records Retention Schedule) and KNPD 1440.1 (KSC Records Management and Vital Records Program).

OTP Records

- Minutes from the meetings
- Hazard analysis (if required)
- Test Procedure
- All the above should be stored in electronic format

Operational Test Data (If required by the customer)

- All relevant test data will be supplied to the customer in the pre agreed format upon completion of testing. The customer or NASA LETF Manager will determine any ongoing storage requirements for the data at the LETF. Note: Long-term test data storage at the LETF is atypical; normally test data is required to be stored in the Kennedy Design Data Management System (KDDMS) for permanent storage.
- All relevant test data as outlined in the test procedure and/or test plans should be in digital format.
- Video files associated with testing shall be kept in digital format. Video associated with clear area monitoring is not required to be stored.

6.0 LETF Operations & Maintenance Activities

This section outlines how the LETF will be managed from an operational standpoint. It includes both processes and products that either exist or will need to be developed to ensure continued safe and efficient operation of the LETF. Operations are defined to include testing, facility operations & maintenance and fabrication activities for all systems.

6.1 NASA Management Approach

The Contractor shall operate and maintain the assigned systems outlined in this plan as defined in the applicable task orders and TOSC baseline systems.

The NASA LETF Manager is responsible for the oversight of all maintenance and testing activities conducted by Contractors at the LETF. The Contractor is responsible for maintaining all systems outlined within this plan. The TOSC LETF Group Manager shall coordinate and obtain concurrence from the NASA LETF Manager to ensure the maintenance objectives that are consistent with NASA policy and guidelines.

All O&M requirements will be communicated to the TOSC contractor via the Task Order System as outlined in KDP-P-1508 or via the TOSC Baseline. The TOSC contractor shall be responsible for the execution of all O&M activities associated with the systems outlined in this plan.

Funding for the maintenance activities will come from multiple sources and it is the responsibility of the NASA LETF Manager, working with the TOSC LETF Group Manager and the TOSC LETF Project Manager to allocate the funding to the appropriate systems utilizing the task order process or the TOSC Baseline.

6.2 Integrated Schedule

The TOSC LETF Group Manager will develop and manage an integrated schedule for all LETF operations. This includes operational testing, fabrication, prototype development, construction and maintenance tasks. The integrated schedule will provide visibility into resource management from both an infrastructure and personnel standpoint, and will provide NASA with visibility to the entire scope of what work is planned within the LETF. This schedule will be updated on a weekly basis and reviewed with the TOSC LETF engineering staff, shop management, TOSC S&MA and the NASA LETF Manager. The TOSC contractor shall have full responsibility to assign and direct personnel to tasks in the integrated schedule. The role of the NASA LETF Manager is to provide oversight only in this regard.

6.3 Annual Maintenance Plan

The NASA LETF Manager and the TOSC LETF Group Manager will be responsible for developing an integrated maintenance plan for the appropriate fiscal year at the beginning of each fiscal year. The role of the NASA LETF Manager is to review and negotiate the scope, funding and schedule for maintenance activities in the LETF with the TOSC LETF Group Manager. The highlights of this plan will include the following;

- Annual LETF Infrastructure/Systems Assessment
- Operations & Maintenance (O&M) estimates for Other Direct Cost (ODC) and Work Year Equivalent (WYE) for each system within the LETF that is not part of the TOSC Baseline.
    - Critical spares identification by system
- Identification of any resource shortages
- Identification of all funding sources
- Funding requirements for O&M activities
- Identification of other relevant maintenance tasks
- Schedule development for O&M activities
- Work Order update requirements for the fiscal year
- Maintainability Analysis
    - Problem reporting and tracking requirements
    - Spares tracking and procurement
    - Reliability Centered Maintenance (RCM) and optimization
    - OMCR currency and applicability
- Training requirements for TOSC personnel funded by O&M sources.
- Sustaining Engineering activities required
    - Identification and estimates for any major upgrades or enhancements based on obsolescence issues with systems.
- Hurricane Preparedness Plan

6.4 Annual Maintenance Report

The TOSC LETF Group Manager will be responsible for developing an Annual Maintenance Report at the conclusion of each fiscal year. This report will include the following items;

- O&M actual costs versus the plan cost by system
    - WYE
    - ODC by system or shop, as applicable
- Requirement Allocation Matrix
    - Documents the completion of all maintenance requirements
    - List of maintenance waivers and rationale by system
- Identification of reliability and maintainability issues by system
    - Product Non-Conformance Reporting (PNCR) tracking by system or shop area.
    - Identification of end items with high failure rates by system
    - Maintenance logs for the systems that require logs
- Sustaining Engineering activities for year.
- Recommendation for the O&M activities for the next fiscal year

6.5 Preventive Maintenance

The Contractor shall be responsible for maintaining all assigned LETF systems. The preventive maintenance program shall keep all assigned systems in a safe and operational condition. The program shall identify and track system/equipment hardware and software problems from identification to resolution and to correct any issues as part of a robust maintenance program. Trending of equipment performance parameters will be maintained, where applicable. The preventive maintenance programs shall take into account KSC policy and guidelines, engineering and/or manufacturer recommendations.

6.6 Corrective Maintenance

Corrective maintenance items are defined as items that require non-scheduled maintenance due to system or component level performance failure or degradation. These items may have been identified during preventive maintenance activities, system operation or inspections. All corrective maintenance items will follow the Contractor's work control systems to document and track system reliability and maintainability metrics.

6.7 Operational Maintenance Logs

The TOSC contractor shall develop maintenance logs for all major test fixtures within the LETF. These logs will be used to document both scheduled and non-scheduled maintenance and issues with the equipment. These logs will require the assigned TOSC engineer/technician to review and maintain by system basis. These logs would be used to record the following;

- Completion of maintenance work orders and operations work orders that are run against the applicable systems recorded by date.
- Identification and documentation of problems or issues in accordance with the TOSC SOP for non-conforming hardware.
- Component replacement conducted.
- Documentation of any non-conformance with any maintenance requirements.

Systems that require operational/maintenance logs to be developed, at a minimum, are as follows:

- Vehicle Motion Simulator and all subsystems
    - This shall include all enabling systems (cooling water, ventilation, hydraulic and power systems)
- 600 Ton Test Fixture
- Vehicle Support Post Test Fixture and all subsystems
- Data Acquisition System
- Cryogenic System & Pneumatic Systems
- Hazardous Gas Detection System
- GSE Integration Testbed
- Water Flow Loop Test Fixture
- ML Simulator Towers A-E
- Video System

The operational/maintenance logs shall be reviewed on a quarterly basis by the NASA LETF Manager and shall form the basis for task order evaluation for maintenance activities and assessment of the readiness of LETF systems to support operations.

6.8 Operational Maintenance Requirement & Specification Requirements

Maintenance requirements shall be defined for each system, lab and shop within the LETF. These requirements will be documented in Operations and Maintenance Requirements & Specification Document by system or area. KPD-P-2713 requires OMRSDs for critical systems. None of the LETF systems are identified as critical. The LETF shall utilize an OMSRD strategy to track and verify maintenance requirements are being met by TOSC.

6.8.1 LETF OMRSD Strategy

A comprehensive review of maintenance requirements will be initiated by the TOSC contractor as part of the on-going maintenance activities. The goal will be to identify maintenance requirements and identify any deficiencies. As applicable to the LETF test infrastructure and systems, the TOSC contractor will develop and maintain file to document the maintenance requirements of those systems. This process will be independent from any other program OMRSD systems. It will be designed and implemented by the NASA/TOSC contractor team and will be a closed system internal to only TOSC LETF activities.

This requirement system shall be used to capture non-drawing data, operations, and maintenance requirements. The requirements will apply to both maintenance as well as operations of the systems.

These requirements will be documented in the applicable Preventive Maintenance Instructions (PMIs), Work Orders or test procedures that govern the maintenance or operational procedures of the specific system. If requirements cannot be met, a

waiver/exception process will be developed to accurately document the occurrence and reason in accordance with the TOSC non-conformance standard operating procedure (SOP).

New systems under development will baseline the respective maintenance requirements at the System Acceptance Reviews scheduled for each system prior to turnover to operations. Systems that are lacking or have deficient requirements documents will be updated.

6.8.2 OMRSD Verification

The Contractor, as part of the required annual maintenance plan will develop a Requirement Allocation Matrix (RAM). The RAM should track maintenance requirements and the work document that performed the item. At the conclusion of the fiscal year, as part of the annual maintenance report, the RAM shall be completed and performance of all requirements verified.

6.8.3 OMRSD Waiver Process

The TOSC contractor shall develop and maintain a waiver process for non-compliance with system maintenance requirements. Signatures required on the waiver shall include the NASA LETF Manager or designee, TOSC Engineering Lead (LETF) and applicable TOSC Safety and/or Quality. The TOSC shall maintain a log of waivers taken during a the year and this shall be included in the LETF O&M Report.

6.8.4 LETF Systems and Infrastructure Requiring OMRSD

The following LETF systems will develop and maintain OMRS requirements and verify that the requirements are referenced and tracked in the appropriate WADs. In some cases the maintenance requirements exist, but must be reviewed and upgraded as appropriate.

LETF Test Fixtures

- Vehicle Support Post Test Fixture and all subsystems
- Vehicle Motion Simulator and all subsystems
- 600 Ton Test Fixture
- Water Loop Test Fixture
- ML Simulator Towers A-E
- Cryogenic Test System
- GSE Integration Testbed

LETF Infrastructure Test & Facility Systems

- GN2 and GHe Systems
- AC Power
- DC Power
- Area Warning Light System
- Video System
- Data Acquisition System
- Hazardous Gas Detection System

- Portable Data Acquisition Systems
- DAS Cable Plant

Table 1 outlines the anticipated funding allocations between the LETF TOSC Baseline and the unique Project funded O&M tasks.

CTCLMS Support and O&M		X	CTC Database Equipment O&M
DAS Lab and Instrumentation Shops O&M		X	
DAS System (including software) O&M	X		
DC Power Systems O&M		X	
Documentation Development, Review & Update	1	2	1: SLS Test; 2: SLS systems; 3: Other
Eyewash Station Inspection		X	
Facility Bonding & Grounding System O&M		X	
Facility Safety Planning		X	
Fiber Optic System O&M	X		
Fluids Test Bench O&M		X	
General Yard and LETF housekeeping		X	
General Yard, Security Fence, and Storage Areas		X	
GSE Integration Test Bed O&M	X		
Hazardous Gas Detection System (Mothball effort)	X		System will be mothballed by SLS
Hazardous Waste Management		X	
Highbay Area / Auxilliary Control Room O&M		X	
Highbay Overhead Crane O&M		X	
Hydrostat Test Area O&M		X	
Instrumentation Grounding System O&M	X		
Instrumentation Trailer and PDAS Carts O&M	1	2	1: Mobile Trailer 2: DAS Lab Mobile Sys
IT Equipment and IT Security		X	
LETF Inventory Management		X	
Machine Shop O&M		X	
Maximo, WAC, and Work Control Support (TAIR Station)		X	For all of TOSC contract
ML Simulator Towers A-E Corrosion Control		X	
O&M Plan & Report	X		
Personnel Management		X	
Pneumatic Distribution Systems (GN2/GHe) O&M	X		Yard Systems
Pneumatic Shop O&M		X	
POL Lockers/Chemical Inventory		X	
PVS: (Re)Certification to KNPR 8715.3 I-1 (contract wide)		X	For all of TOSC contract
PVS: In-House Calibration Verification and ISI's (contract wide)		X	For all of TOSC contract
Records Management per KNPR		X	
Safety Support (inspections and ops)		X	
Safety Walkdowns and PPE inventory management		X	
Spares & Consumables Inventory Management	1	2	1: SLS systems; 2: Other
Video System O&M	X		
VMS Cable Management System O&M	X		
VMS Control System O&M	X		
VMS Hydraulic Cooling System O&M	X		
VMS Hydraulic System O&M	X		Includes OEM contrat with MTS
VMS Motion & Static Structures O&M	X		
VMS Ventilation System O&M	X		
Water Flow Loop (Mothball effort)	X		
Water Supply, & Trench Sump Pump System		X	
Weld Shop O&M		X	
Yard Area Lighting System O&M		X	
LETF Safety Plan		X	

Table 1: System Funding Allocations

7.0 Maintenance of Base Support Systems

7.1 Institutional Systems

Currently the Base Operations Contractor is obligated to provide a wide variety of support to the LETF. NASA Engineering Directorate working with the Base Operations Contractor and TOSC contractor will establish a very clear line of demarcation to delineate those areas of responsibility for the Institutional and TOSC contractor. This is necessary for NASA to provide the TOSC contractor the ability to respond to the NASA mission as it relates to meeting NASA's testing needs in the most efficient means necessary. The LETF TOSC contractor shall utilize the NASA Facility Manager or the TOSC LETF Facility Manager to coordinate all work with Institutional Services Contract (ISC). The LETF Facility Managers (NASA and TOSC) shall maintain a data base of support requests and issues with ISC maintained systems in the LETF.

7.2 IT Systems

The communication and IT systems that shall be maintained by the base support contractor responsible for communications and IT systems are listed below. As with the base operations systems, these items are not part of the LETF funding line.

- OIS-D
- Paging & Area Warning System (PAWS)
- Non TOSC servers associated with desktop PCs
- Telephones

8.0 S&MA Management in the LETF

The Contractor shall comply with all applicable KSC policies and procedures in place at KSC governing KSC safety and quality practices. These requirements are documented in KNPR 8700.2, and KNPR 8715.3-1 KSC Safety Practices and Procedural Requirements. The Contractor shall be responsible for S&MA activities associated with the LETF with oversight from both the NASA Engineering Directorate and NASA Safety.

The NASA LETF Manager working with NASA S&MA will provide oversight and monitoring activities within the LETF. NASA S&MA already provide safety oversight in the LETF via audits and inspections. The intent is to enhance this effort were it is determined appropriate. In the event that a safety variance or waiver is required it shall be coordinated with the NASA LETF Manager.

9.0 Acquisition Planning/Logistical Support/Sustaining Engineering

The LETF development and operations task shall be accomplished using the following methodologies:

a. Design, development, and operations will be accomplished through task orders, change requests or AVO's to onboard engineering support contracts for systems and critical GSE, within contract limitations.

b. Design and development of selected GSE and system components will be achieved through performance-based specifications, build-to-print designs, and design-build contracts.

c. Construction and installation may be performed with indefinite-delivery and/or indefinite-quantity construction contracts, if applicable.

d. Systems and GSE design, development, and installation will be performed through existing engineering support contracts.

e. The use of commercial off the shelf (COTS) items shall be maximized to reduce costs both in development and operations.

f. NASA Engineering Directorate will assign applicable discipline design engineers to oversee the development or modification to LETF systems.

9.1 Critical Spares Identification and Tracking

The Contractor shall maintain critical spares as identified by the system designers, manufacturers and operational experience. Stocking of spares should be kept to a minimum and should be long lead critical items that are needed to keep the systems operational. The Contractor shall develop a process to track and maintain these items from year to year.

A detailed life cycle cost estimate for O&M, sustaining engineering and materials will be documented in the Annual LETF O&M Plan. Critical spares list shall be part of this plan, along with cost and replacement schedules. The critical spares listed will be finalized at the Systems Acceptance Reviews and updated in the life cycle cost estimate. Historical data will be collected by the Contractor to track the actual spares costs based on operations and will be included in the annual LETF O&M Plan.

9.2 Logistics Support for Non-Critical Items

The Contractor does not maintain a logistic organization in regards to assigned systems. Contractor assigned systems/equipment are generally shop, lab type equipment. None of the systems in the LETF are considered critical in support of flight programs. The Contractor shall utilize the Federal Stock System for all non-critical spares and/or the

Contractor procurement system for items not available in the Federal Stock System. Center Federal Stock System guidelines shall be followed as directed by NASA.

9.3 Sustaining Engineering

The Contractor with NASA oversight shall be responsible for all sustaining engineering activities associated with assigned systems. Sustaining Engineering is defined as maintenance of systems drawings and documentation to KSC standards, engineering changes to these systems and the associated documentation, configuration management of the system documentation and the implementation of any system changes per the documented engineering. Sustaining engineering requirements and activities shall be documented in the LETF O&M plan and approved by the NASA LETF Manager. NASA engineering design disciplines shall be utilized to lead any system or facility modifications as required. The NASA LETF Manager will act as the primary point of contact to obtain support from the NASA Engineering Directorate.

10.0 TOSC LETF IT Security Plan

The LETF IT Security Plan lists security requirements, defines risks, and describes security measures to be implemented. This shall ensure that a security risk analysis is performed for the system, and that appropriate security controls are put in place. The security plan shall define roles and responsibilities for security of the system, as well as standard operating procedures. The LETF Security Plans and technical support required to maintain the Plan is funded under the TOSC Baseline for the LETF.

The LETF is covered by two separate plans, one of which is a moderate risk plan that also covers many of the KSC labs and the computers in these labs which connect to the KSC Institutional Network (CD-9999-M-KSC-4497), and the second plan which is a high risk plan that covers the Data Acquisition and Control Computers in the LETF that monitor and control test articles (CD-9999-H-KSC-3161).

The plan is a living document that requires review every three years or when a major modification occurs, and milestone or completion dates for planned controls.

Appendix A: LETF TOSC Assigned Systems and Infrastructure

Test Fixtures

- Vehicle Motion Simulator
    - VMS Hydraulic System
    - VMS Electrical System
    - VMS Cooling Water System
    - VMS Ventilation System
- 600 Ton Test Fixture
    - All supporting lifting hardware
- Water Loop Test Fixture
- Cryogenic System
- Hazardous Gas Detection System
- GSE Integration Test Bed
- Hold Down Post Test Fixture
    - Hydraulic System
- North ML Tower Simulator
- East ML Tower Simulator

LETF Facility Systems

- GN2 System
- GHe System
- Video Distribution System
- AC Power
- DC Power
- Area Warning Light System
- Data Acquisition System
- Control Room
- Cable Plant
- Fiber Plant
- Data Acquisition Trailer
- LETF High Bay (Funded by the TOSC Baseline)
    - High Bay bridge crane

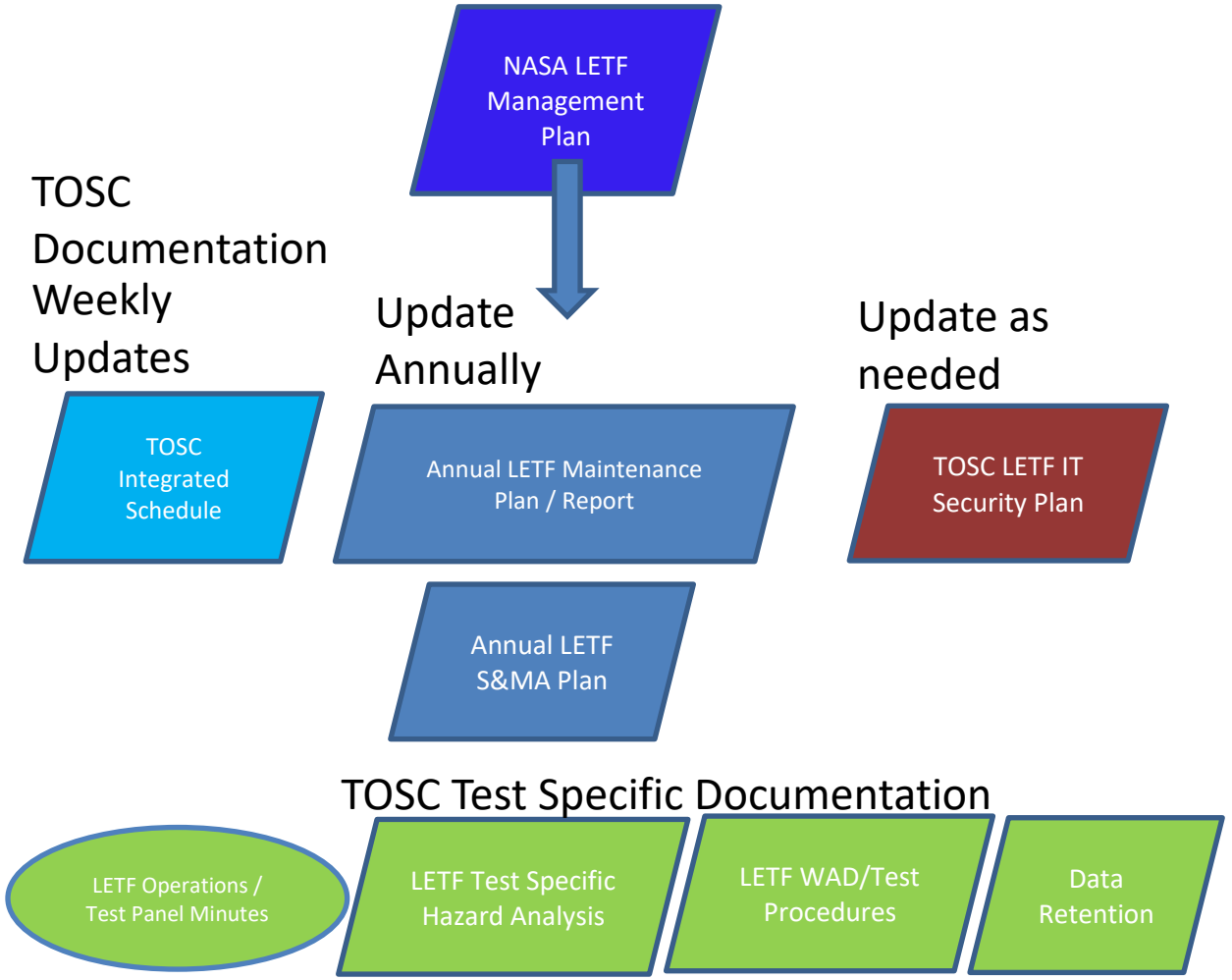
LETF Shops (Funded by the TOSC Baseline)

- Pneumatic Shop
- Machine Shop
- Weld Shop
- Cable Fabrication and Molding Shop

LETF Labs (Funded by the TOSC Baseline)

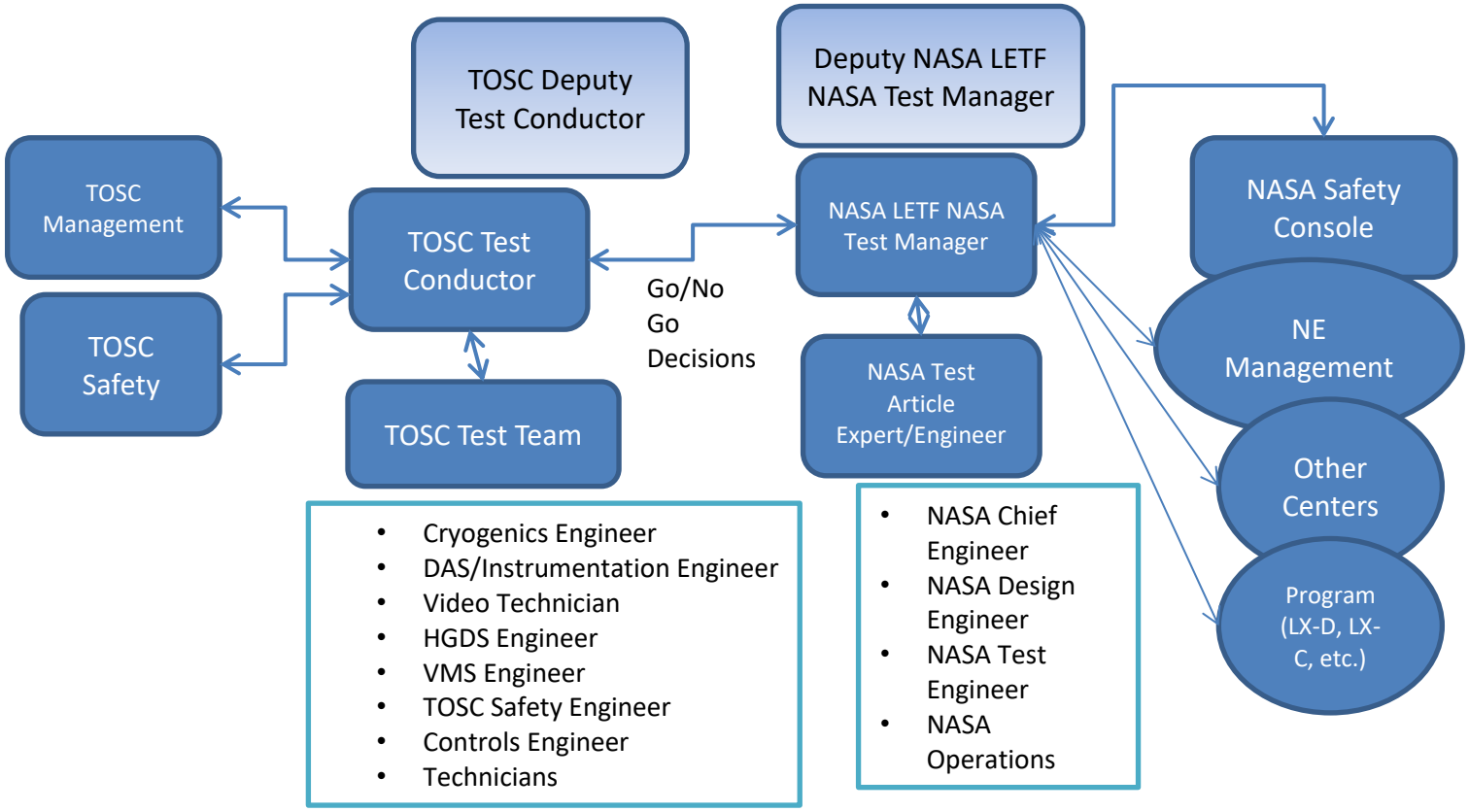
- Data Acquisition System Lab
    - Portable Data Acquisition Systems

Appendix B: TOSC Planning required to meet NASA LETF Management Plan

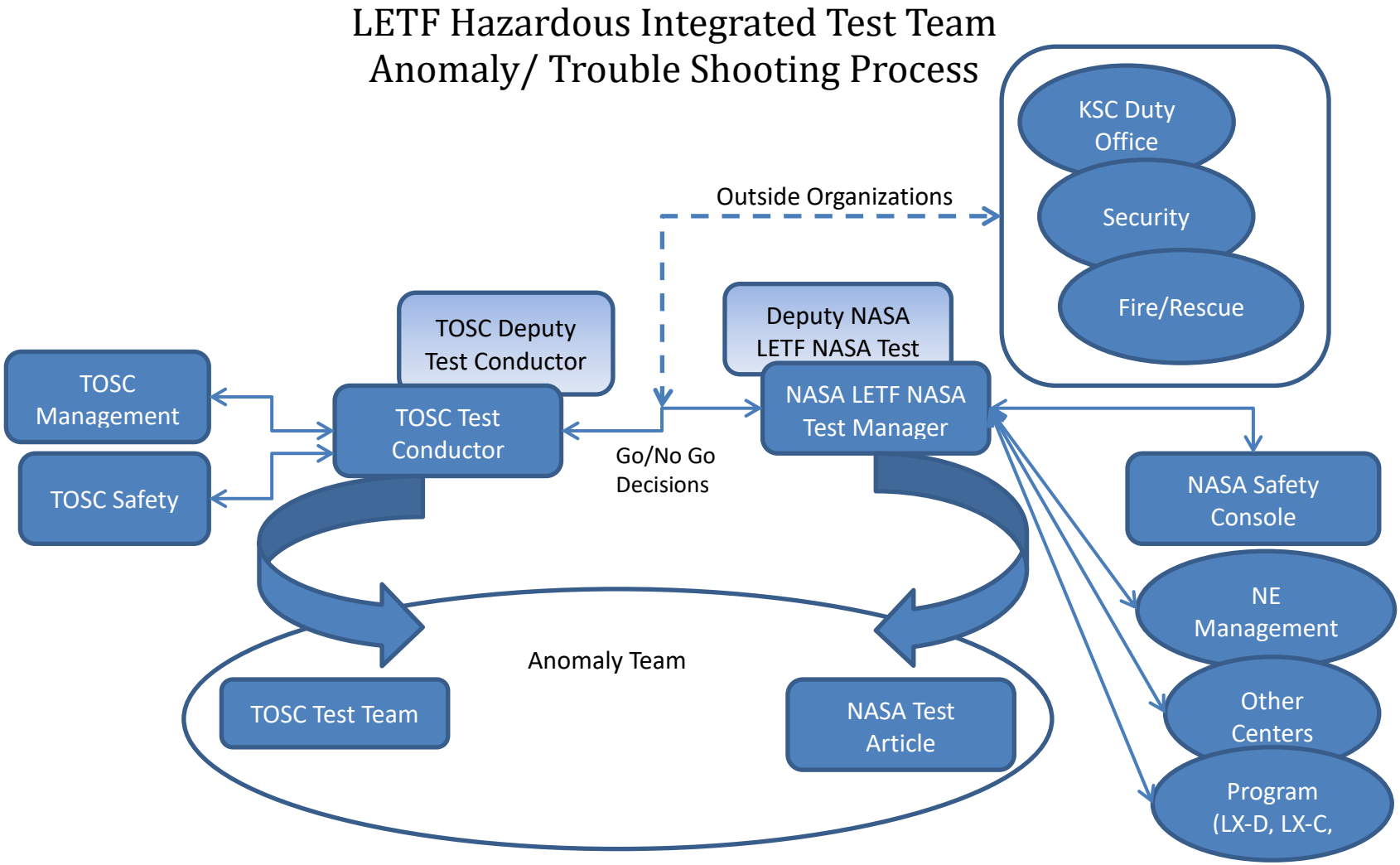


Appendix C: LETF Test Team & Anomaly Resolution Process

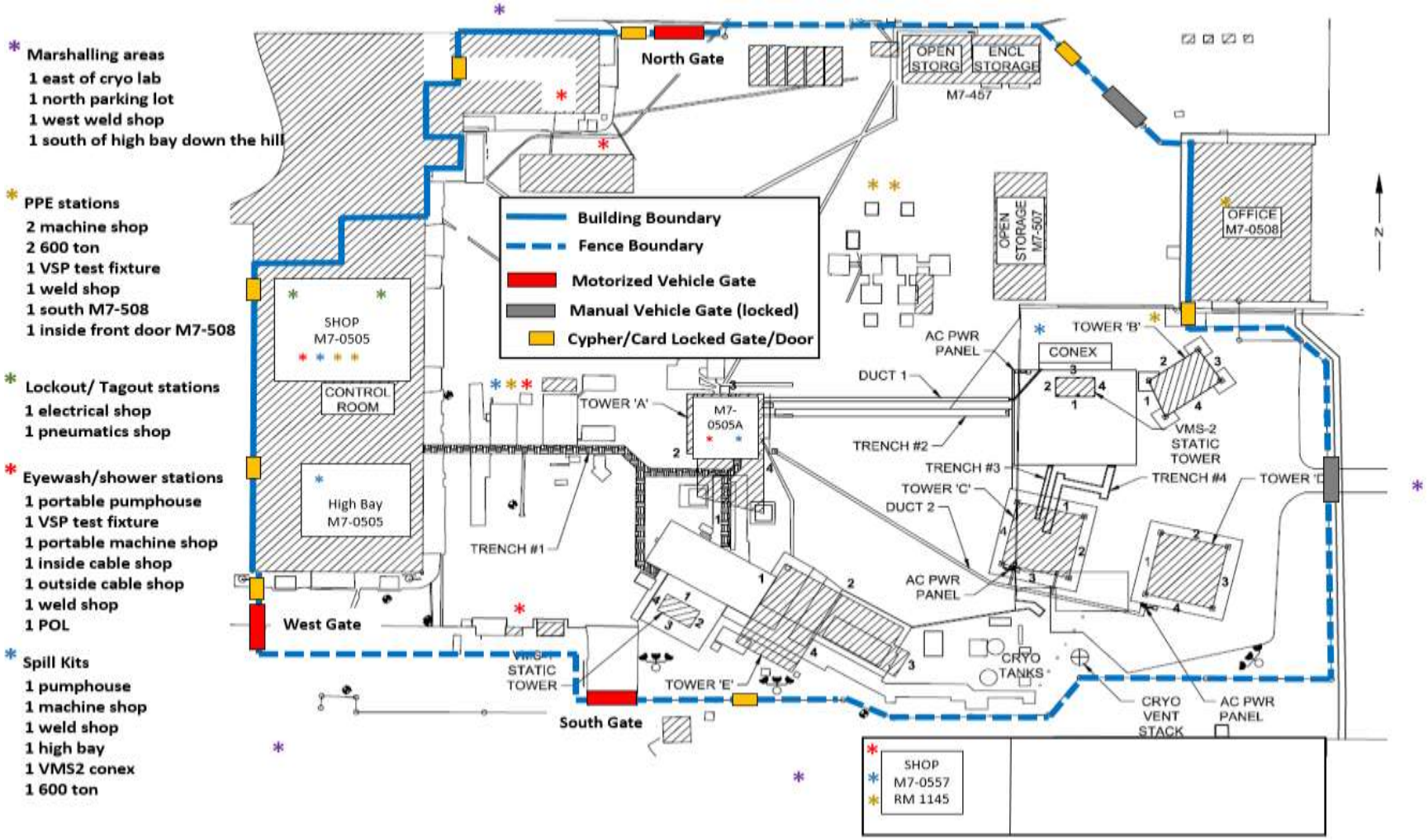
LETF Hazardous Integrated Test Team



Appendix C (Cont.)



Appendix D: LETF Boundaries and Points of Entry



NOTE: Vehicle gates (gates 1-4) will be controlled by TOSC LETF personnel and will be locked at all times. Authorized personnel will have keys assigned to them. All others must check in at the LETF Support Building (M7-0508) to gain entry.

Appendix E: LETF 600 Foot Quantity Distance Circle for Hydrogen Testing